

REMARKS

Applicants have now had an opportunity to carefully consider the Examiner's comments set forth in the Office Action of August 20, 2008. Claims 3-4, 6-15 and 21-38 are currently pending. Claims 1-2, 5, and 16-20 have been cancelled. Claims 3, 6-9, 21, 25, 31 and 35 have been amended.

I. The Office Action

Claims 3, 5, 7-9, 21 and 24-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Parker et al. (US 1,846,978).

Claims 3-9, 21, 22 and 24-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hays (US 2,087,031) in view of Onimaru et al. (US 5,616,021).

Claims 10-13 and 31-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hays (US 2,087,031) in view of Onimaru et al. (US 5,616,021), as applied to claim 3 above, and further in view of Durst et al. (US 5,522,723).

Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hays (US 2,087,031) in view of Onimaru et al. (US 5,616,021) and Durst et al. (US 5,522,723), as applied to claims 10 and 13 above, and further in view of Martin et al. (US 5,165,884).

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hays (US 2,087,031) in view of Onimaru et al. (US 5,616,021) as applied to claims 21 and 22 above, and further in view of Yamane et al. (US 3,982,878).

II. Anticipation Rejection in view of Parker

Claims 3, 5, 7-9, 21 and 24-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Parker et al. (US 1,846,978). Applicant submits that this rejection should be withdrawn for at least the following reasons. Parker does not teach or suggest the invention as set forth in the subject claims.

According to the arguments presented in the Office Action of August 20, 2008, it is possible that the Examiner is misinterpreting Applicant's claims. Therefore, claims 3, 21 and 25 have been amended to further clarify Applicant's invention. Particularly, claim 3 has been amended to recite a device comprising, among other things, a burner that provides for combustion of a fuel/oxidant mixture, having a combustion temperature above 2500°C, within a said combustion chamber at a temperature below said combustion temperature. Applicant

asserts that the amendment clarifies that the claimed device provides for, and can only endure, combustion below typically combustion temperatures.

The Examiner made the analogy that the concept of the present invention is similar to a baking pan capable of enduring a 450°F oven clearly being capable of enduring a cooler 350°F oven. This is simply not analogous to the present invention. The invention does not use, to stay within the picture, a baking pan which endures 450°F but uses a pan which endures only 350°F (it would be destroyed at 450°F) in an oven that is designed such that the temperature can be lowered to 350°F. Since the material is part of the device (the pan would be a fixed part of the oven), the device differs from other devices having materials which endure higher maximum temperatures. According to the Examiner's own statements on page 20, "Parker et al. discloses that the material 7^{x1}(i.e., refractory material of substantially spherical form; see FIG. 8) is structurally capable of enduring the combustion temperature of the fuel and oxidant mixture." As seen in Example 4 on page 31 of the disclosure, the present device may have endure a combustion temperature of approximately 600° as compared to the typical 2500°C combustion temperature. If the presently-claimed material was used in a typical combustion chamber, the device would self-destroy itself in use. Contrary to the Examiner's assertion that "a maximum temperature" is functional language, the lower maximum temperature endured by the material is a specific property that distinguishes the material from known devices.

Particularly, claims 3 and 25 have been amended to specify that the pre-mix chamber receives the oxidant and fuel via separate lines to ensure no mixing occurs prior to entering into the pre-mix chamber. As shown in Fig. 8 of Parker, it appears that fuel and steam are supplied via nozzle 9^x together to tube 6^x where the fuel/water steam are mixed with oxygen (p. 4, lines 78-110 and p. 5, lines 8-20). To the contrary, the device as described in amended claims 3 and 25 and displayed in Figure 4a, supplies the materials through separate supply lines to the premix chamber and only then are the materials allowed to mix. More particularly, the amended claims specify that the separate lines supplying the pre-mixing chamber are tangentially arranged about the pre-mixing chamber. Conversely, in Fig. 8 of Parker, the single supply line 9^x is centrically arranged with respect to tube 6^x. The tangential arrangement is ideal for the present invention to lower the flame velocity of the mixtures.

Referring specifically to independent claim 21, an amendment has been made to include that the system length is less than one meter. Generally, walls of combustion chambers need to

be far apart and cooled due to high combustion temperatures. However, this proves to be a disadvantage because the outer regions of such flame cool down to such an extent from the heat transfer of the cooled walls that the conversion of the reactants takes place only slowly or comes to a stop. It is an object of the present invention to lower the combustion temperature and thereby reduce the size of the system to less than 1 meter in length. Parker fails to teach or disclose such a feature.

For at least the aforementioned reasons, Parker fails to teach or suggest the subject invention as recited in independent claim 3, 21 and 25 (along with claims 7-9, 24 and 26-30 that depend therefrom). Accordingly, it is respectfully requested that the rejections be withdrawn.

III. Obviousness Rejections

The Examiner further rejects independent claims 3, 21, 25, 31 and 35 under 35 U.S.C. 103(a), citing Hays (U.S. 2,087,031) as the primary reference. Applicant respectfully asserts that Hays does not, individually or in combination with any of the cited references, teach or make obvious the subject invention as embodied in the claims.

As stated more thoroughly above, the present inventive device includes a material which endures a maximum temperature that is less than the combustion temperature (generally above 2500°C). There is no mention or suggestion in Hays indicating that the refractory material can withstand temperatures below the combustion temperature of a fuel/oxidant mixture, and cannot endure temperatures as high as the typical combustion temperature of the mixture. Applicant refers the Examiner to the above explanation with reference to Parker since it applies similarly to Hays.

Additionally, Hays fails to teach or suggest a pre-mixing chamber wherein each component to be mixed is separately and tangentially fed into the pre-mixing chamber to lower the flame velocity of the mixture. Hays teaches of a chamber M for receiving and distributing the combustion-supporting gas. The gas circulates among the fuel-injection nozzles and then passes with the fuel through the orifices O. Therefore, the gas does not actually mix together in the chamber, but mixes as it passes into the combustion chamber. Due to the fact that the fuel is never released into chamber M, it is not possible for the fuel to be tangentially added to the mixing chamber.

The Examiner acknowledges that Hays fails to disclose an additional supply line in

communication with the low combustion value gas supply and the combustion chamber and cites Onimaru (US 5,616,021) to supplement. It is the Examiner's position that it would have been obvious for one of ordinary skill in the art at the time the invention was made to provide at least one additional supply line connected to the low combustion value gas supply, in order to conduct the low combustion value gas into the combustion chamber in the apparatus of Hays, because the additional supply line would allow for the combustion products to be recycled to the combustion chamber, thereby making it possible to properly maintain the fuel burning condition at a desirable and stable condition so as not to induce an excessive air supplying condition with respect to the supplied fuel when the fuel supply amount is reduced.

Applicant respectfully disagrees with the Examiner, since Onimaru fails to make up for the aforementioned deficiencies of Hays. The same holds for each of the references cited by the Examiner to supplement Hays. Therefore, Applicant respectfully requests that the Examiner remove the rejections to claims 3, 21, 25, 31 and 35 and those claims dependent therefrom.

CONCLUSION

For the reasons detailed above, it is respectfully submitted all claims remaining in the application (Claims 3-4, 6-15 and 21-38) are now in condition for allowance.

Respectfully submitted,

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